

# IWR White Paper

October 2008


## Issues and Applications in Formulation and Evaluation Considering the 4 P & G Accounts



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Engineering Circular 1105-2-409 (EC 409) “Planning in a Collaborative Environment” is a significant policy in the Corps’ recent history, mainly due to its renewed emphasis on considering the four Principles & Guidelines accounts: National Economic Development, Environmental Quality, Regional Economic Development, & Other Social Effects in the formulation and evaluation of civil works infrastructure. In addition to encouraging collaboration with sponsors and stakeholders, EC 409 redirects the Corps to pay attention to factors other than National Economic Development in making investment decisions. In doing so, the EC encourages the development of water resource solutions which best reflect the full range of national interest and are more holistic, sustainable, and acceptable.

EC 409 establishes the philosophy for consideration of the four P&G accounts in formulation and evaluation, but does not convey the practical details associated with formulation and evaluation, the level of analysis required, or the applicability and emphasis of each account, among other things. And while the Corps has a long history of addressing the Environmental Quality account given its experience with NEPA and ecosystem restoration, the Regional Economic Development and Other Social Effects accounts are a bit harder to apply to the Corps traditional planning process.

This white paper highlights the challenges and potential approaches when considering these accounts in project planning, particularly with respect to formulation, evaluation and selection. The advantages and disadvantages of each approach are discussed to help inform discussion on this topic, which is believed to be quite relevant given recent WRDA 2007 proposals calling for updates and revisions to the Principles & Guidelines, regulations, and circulars. The paper also identified other issues towards the end of the white paper which may require follow-up study or special attention.

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## Acknowledgements

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## **1. Background**

The four Principles and Guidelines accounts have consistently appeared in federal guidance in some form over the past 70 years; however, their roles and comparative importance has varied greatly.

- \* 1936 Flood Control Act provided one of the first mandates to the Federal government requiring benefits to exceed costs while considering the lives and security of its people.
- \* 1962 Senate Document 97 promoted 3 objectives (economic development, environmental stewardship, and well-being of people).
- \* 1973 Principles & Standards emphasized 2 Federal Objectives and 4 Accounts (National Economic Development (NED), Environmental Quality (EQ), Regional Development (RD), & Social Well Being (SWB)).
- \* 1983 Principles & Guidelines shifted emphasis back to one Federal Objective (NED) while proposing other accounts only to be used to help decision-making.
- \* 1986 WRDA'86 established new project cost sharing rules and forced local sponsors to assess the regional and local economic impacts of plans.
- \* 2003 Corps publishes EC1105-2-404, Planning Environmental Operating Principles, calling for balanced environmental and economic considerations throughout the planning and the life cycle of projects.
- \* 2005 Corps publishes EC1105-2-409, with emphasis on selecting plans based on the full array of 4 P & G accounts.
- \* 2007 Section 2031 of WRDA'07 directs the Secretary of the Army to revise the Principles & Guidelines, urging greater emphasis on collaborative, multi-objective planning.

In accordance with EC 1105-2-409, all Corps Civil Works decision documents will “evaluate, display, and compare the *full range of alternative plans’ effects* across all four P & G accounts (NED, EQ, RED, and OSE)”. This directive encourages Corps planners to collaborate with stakeholders and sponsors in order to develop and recommend plans that provide additional benefits and/or avoid negative impacts, and not simply what was once viewed as Federal or primary budget priority benefits. This new mentality, in effect, encourages planners to explore more holistic, intergovernmental and inter-sectored solutions which may be more efficient and effective than plans adhering to more narrow definitions of “federal interest” or “Corps interest”. As an example, the full impact of beach recreation (much of which is currently considered a regional, not a national benefit) could now be considered as a basis for recommending

construction of a project. It is important to recognize that the implications of considering the 4 accounts are not just for the non-Federal sponsors and other stakeholders (though cost sharing policies concerning NED plans remain in effect). Federal interests could possibly formulate plans that are quite different from what had been formulated in the recent past.

## **2. EC 409 Provides More Flexibility**

EC 409 offers the philosophical/policy foundation for a more agile, flexible and responsive planning process. After all, it is this flexibility that helps to reduce the constraints in planning. Nevertheless, there are several areas which may need further clarification. Sections 4a and 4b explain that the EC arose out of criticism regarding the Corps' technical analyses and the lengthy planning process, but by including more accounts and more stakeholders, it is untold how technical accuracy and speed will improve. (Certainly given more stakeholders, the quality control review process will become more transparent and could result in more accuracy while sharing information with sponsors may save time). In another part, the guidance states that its purpose is to help formulate "better plans" and promote "better decision making". There is little discussion on just what defines plans as "better".

Perhaps the part deserving the most attention is in Section 4c, sub-part (3) which states that:

"any alternative plan may be selected & recommended for implementation if it has, on balance, *net beneficial effects*, in the 4 P & G evaluation accounts."

The term "net beneficial effects" is not consistent with the NED policy, which clearly mandates recommending plans that optimize the net national economic benefits. Many feel the term was derived from recent guidance relating to combined plans.

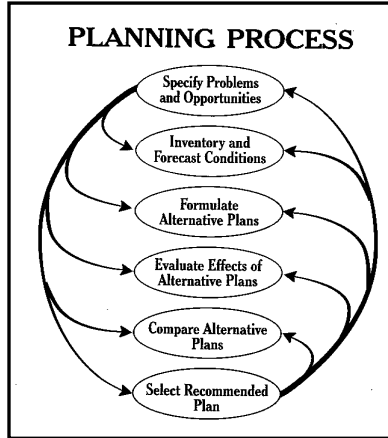
The P & G offers great latitude to include 4 accounts, but does not force planners to use them. However, what's the point in collecting such information if we do not use the information from the 4 accounts for decision-making?

Lastly, there are concerns with how EC 409 aligns with other requirements of the P & G, namely the Federal objective. After formulating and evaluating for the "4 Accounts", a project delivery team could very well decide on a project with little or no NED components, yet the P & G clearly requires us to identify NED plans or seek

exceptions from ASA (CW). Consistent with the P&G, Section 7(e) of EC 409 reaffirms the requirement for districts to identify the NED Plan and request a waiver from the NED plan and as early as the Alternatives Formulation Briefing (AFB) milestone.

### 3. Options for Formulation<sup>1</sup>

In order to effectively formulate within the context of “4 Accounts”, it is crucial that planners be cognizant of the accounts long before the formulation begins. Ideally, this would take place during the problem identification or Step 1 of the 6-Step Planning Process.



Planning objectives, which are crafted after identifying problems, needs and opportunities, influence the formulation strategies and the types of management measures considered in the planning process. Furthermore, by engaging the stakeholders early on, a PDT can gain key information about who is affected and how strong their preferences are, both of which are primary components of OSE and RED.

The table below summarizes the products, questions and methods a planner should take during the first step of the planning process within the context of OSE.

#### *OSE Analysis Contributions to Planning Step 1—Specify Problems & Opportunities*

<b>Desired Output of Analysis</b>	List of key stakeholders, issues, problems, preferences of stakeholder groups, inputs to planning objectives
<b>Key OSE Questions</b>	<ul style="list-style-type: none"> <li>What is the history and historical development of the local and regional area?                             <ul style="list-style-type: none"> <li>What is the history of the water resources situation?</li> </ul> </li> <li>What groups have economic, cultural, and other stakes in the situation?                             <ul style="list-style-type: none"> <li>How do stakeholders define the problems, needs, opportunities, &amp; constraints? What are their priorities? What kinds of effects are they interested in achieving/avoiding?</li> </ul> </li> <li>What are the dynamics of social life in the local and regional area?                             <ul style="list-style-type: none"> <li>How is the social landscape configured? What basic “social statistics” can be used to describe the population and portray quality of life factors?</li> <li>What groups are especially vulnerable?</li> </ul> </li> <li>What is the structure of the civic infrastructure, and how does it function?</li> </ul>
<b>Common Tools</b>	Stakeholder identification methods, workshops, interviews, surveys (OMB-approved, and those obtained from other sources), historical analysis, content analysis, social profiling

*Source: OSE Handbook*

The second step of the planning process focuses on the problems in greater detail, namely inventorying and forecasting the conditions of resources that will be affected by solutions to the problems.

<sup>1</sup> The word formulation as used in this document refers to the process of identifying potential management measures and combining them into alternative plans. Options for evaluation and comparison, normally done as part of the formulation process, are discussed in a separate section of this document.

By the end of the first two planning steps, a PDT should have a better sense of the relative importance of each of the “4 Accounts”. When investigating a flood risk management problem, for example, a planner may discover that the threat to lives, well-being and overall public safety are quite significant in the study area. Consequently, the OSE account will most likely be at the forefront in formulation. On the other hand, a small navigation project may have less emphasis on OSE.

With this in mind, several strategies were developed on applying the four accounts within formulation. They include: (1) formulating for NED/NER benefits and displaying the impacts to OSE and RED; (2) formulating for NED/NER benefits and adding minimal measures to minimize negative impacts or produce benefits for OSE and RED; (3) formulating for benefits in all four accounts; and (4) formulating for NED/NER/OSE benefits and excluding RED when formulating alternatives. These strategies are by no means exhaustive; many variations can be developed, e.g., formulating for one account while not violating EQ, etc.

### **Strategy 1: Formulate for NED/NER benefits and display impacts to OSE and RED**

This has been, more or less, the status quo. Planners develop measures with the mindset of maximizing the net national economic or environmental output. As directed by policy, the impacts to OSE and RED accounts are displayed and considered, but generally long after the alternatives are formulated. In some cases, this is reasonable. RED effects from a project may not be revealed until much of the project’s features are known.

By deferring the OSE and RED analyses to later in the planning process, formulation is more straightforward and presumably cheaper than by formulating for all accounts early on. However, this results in plans that only address mitigating for potential impacts and disregard opportunities for gaining additional benefits in OSE and RED. Stakeholders and other partners have been discouraged by the lack of emphasis on the OSE and RED accounts. Maintaining the status quo defeats the purpose of EC 409.

- Advantages: Relatively easy to perform; familiar to many planners; consistent with P & G’s Federal objective requirements; and, data demands are later in the process.
- Disadvantages: Stakeholder/sponsors could become disenfranchised; does not capture opportunities for potential OSE/RED benefits; potential lower budgetary priority; and, possible need to reformulate and seek additional funding later on.

## **Strategy 2: Formulate for NED/NER benefits and add minimal features for OSE/RED**

In this option, the team may modify an NED/NER feature or plan to provide more OSE or RED benefits. Recreation features along with their additional OSE and RED benefits are often developed in this manner.

- Advantages: Relatively straightforward to perform; requires consideration of the “4 Accounts” from the initial stages of the planning process; captures some opportunities for benefits for OSE and RED; and, would have higher budgetary priority.
- Disadvantages: Conflicts may arise on defining “minimal features”. May still not fully incorporate OSE & RED into formulation.

## **Strategy 3: Formulate for Benefits under the “4 Accounts”**

This represents a drastic departure from NED/NER-focused formulation and poses an extremely difficult challenge for planners. On the one hand, by compiling sufficient details of OSE and RED as early as the problem identification process, management measures will best capture diverse stakeholder interests and meet environmental requirements. This will also link management measures to planning objectives, unconstrained by NED policies or agency authorities, and in cooperation with full range of stakeholders and participatory agencies, so that many comprehensive alternatives, many of which produce “low regrets” would be developed. One strategy could be to only formulate plans that provide OSE and RED (in addition to NED/EQ). If an alternative does not address the majority of social concerns and/or regional economics, eliminate it altogether. This will best fulfill the purpose of EC 409.

The downside is that the process could become far more complex, expensive and time-consuming and very few Corps planners have hands-on experience with OSE/RED-focused formulation. IWR is presently developing software and handbooks that will be useful in formulation and evaluation, but those may still not reduce the amount of data that would need to be collected.

Formulating for all four accounts would work best in large watershed studies although a beach nourishment project, having obvious NED (reduced storm damage), EQ (improved piping plover habitat), RED (beach-related income and employment) and OSE benefits (recreation visits and nearby property values) could also work. Enough documentation would still be required to support exceptions from the NED, as the guidance mandates the Corps to request a ASA(CW) waiver at the Alternatives Formulation Briefing (AFB) or shortly thereafter.

- Advantages: Stakeholder involvement/satisfaction greatest; Best in addressing EC 409 as all accounts are considered equally during formulation; Great for large watershed studies.

Disadvantages: Complex; Costly; Lack of extensive field experience with OSE/RED formulation; Subjective; Politicizes process somewhat; May be cumbersome for smaller studies.

**Strategy 4: Formulate for NED/NER/OSE benefits while excluding or de-emphasizing RED**

This modified approach is less daunting than formulating for all four accounts equally and simultaneously. A planning team could decide to only include OSE when formulating alternatives. The lives impacted, loss of community cohesion, and other quality of life metrics will have a bearing on the array of solutions that are generated. As an example, a flood risk management planning objective would likely focus on reducing the negative economic and social effects of flooding. A potential OSE management measure might be the development of a flood warning system targeting the elderly or other especially vulnerable populations.

As the formulation progresses, the PDT can elect whether or not to bring in the RED account, thus deeming the RED impacts as incidental or as add-on components. The formulation is more manageable while sponsors would still be actively engaged and welcome their active role in the formulation process. It's important to recognize each application would vary based on the type of study at hand. It may be perfectly appropriate to consider OSE-only plans in watershed studies.

- Advantages: In accordance with EC 409; May often be more manageable than formulating plans for all 4 accounts; Stakeholder remains active in the formulation process.
- Disadvantages: Costly; Lack of expertise with OSE-based formulation; Subjective; Alternatives may overlook or downplay local economic impacts.

Formulation Option	Complexity of Formulation	Ease of Implementation	Level of Sponsor Involvement in Formulation
NED/NER, impacts on OSE/RED	Low	High	Varies
NED/NER, minimal features OSE/RED	Medium	Medium high	Medium to High
Formulating for all 4 Accounts	Highest	Low	Highest
Excluding RED	High	Moderate	High

## **4. Options for Evaluation/Comparison<sup>2</sup>**

Evaluation of plans considering the 4 P&G accounts poses many challenges for Corps planners. For instance, when evaluating the OSE and RED impacts, the first question to ask is how much information would be required? And, is there a reasonable limit to the number of factors to be included? Another challenge is assessing the effects which, most of the time, are not mutually exclusive. Finally, as experience on the recent Louisiana Coastal Protection and Restoration Project has shown, it is difficult to distinguish between alternatives, when including OSE & RED, especially when the metrics are qualitative.

During evaluation and comparison, the level of information for the NED or EQ accounts would not likely change as the Corps has a long history of evaluating these accounts. The OSE account should always be considered during evaluation and comparison, but its significance may vary according to business line and by parameter within the account. Loss of Life (within OSE), for instance, will probably be given greater consideration during flood risk management projects than for navigation projects. The RED account, also should always be considered during evaluation and comparison, but could often be dealt with later in the process.

**How do we interpret the directive to “evaluate, display, & compare the full range of alternative plans across all 4 P & G Accounts”? In other words, how much do planners have to do and how much can they do?**

The Corps has certainly developed more comprehensive and defensible projects as a result of collaboration and complete attention to all of the accounts. At the same time, we’ve built high-quality projects with only an NED-account focus while mitigating for other impacts. The P & G gives us great latitude to include four accounts; however, it is not expected in every situation.

Two approaches to evaluating and comparing plans considering the four accounts were identified. The first option described may be characterized as the minimum approach. If the effects described under the first option can be quantified, then a trade-off analysis (making trade-offs between the four accounts) can be performed, potentially employing Multi-criteria decision analysis (MCDA) tools. This is a second option for “evaluating, displaying, and comparing the full range of alternative plans across all 4 P&G Accounts.” Finally, other means of quantifying or characterizing effects in the OSE and RED accounts are also described (but are by no means exhaustive).

**(1) Evaluate in traditional format but engage stakeholders to develop “System of Accounts” table/ effects matrix**

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<sup>2</sup> In the evaluation step, the significant contributions or effects of an individual plan are quantified and judged; Comparison is the subsequent step and involves comparing the differences among plans.

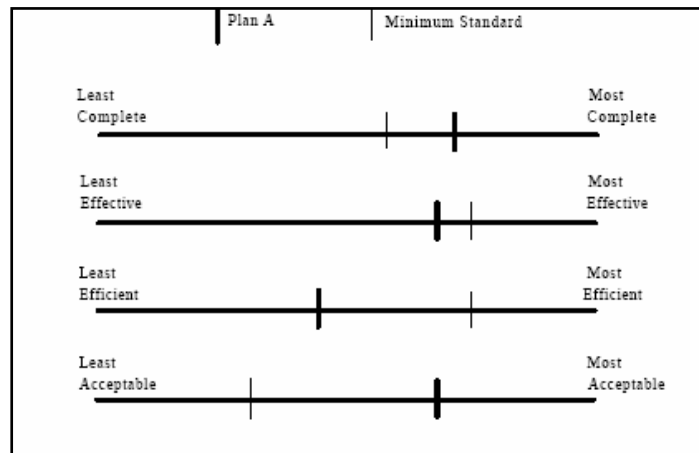
One approach would be to see how each of the 4 accounts contributes to the project's overall purposes or planning objectives. If the project's main objective is to provide coastal storm reduction, the team could hone in on reduced storm damages (NED), environmental restoration (EQ), recreation opportunities (OSE) and local employment gains (RED) in that particular order. Small harbor navigation may only include NED and RED. Numeric or percent change could be one way of measuring the improvements of a project. Some criteria may only be able to be described qualitatively in a narrative format.

This could be done in as simple a fashion as the traditional tables showing a "System of Accounts" or "Effects Matrix" that have been displayed for years in Corps project feasibility reports. In fact, this may be the "minimum" level of interpretation of the requirement of EC 409. The PDT would need to demonstrate that in fact all significant effects across the 4 accounts have been taken into account by documenting in a table the effects considered by account and how the various alternative plans compare to each other in terms of those effects. A collaborative team that by definition includes project stakeholders can then examine each plan's effects for each of the 4 accounts. Using the results that were either data-driven or estimated by the team, the team can then prioritize the results from each account. The main advantage is that the process is transparent. The downside is that given grossly different metrics, subjectivity must be used when making the ultimate decision. If the stakeholders strongly feel OSE and RED are of the utmost importance, NED may be downplayed so much as to engender skepticism from ASA (CW) and OMB. Furthermore, the level of overlap, e.g., NED/OSE can vary greatly among alternatives.

The table below offers a simple example of such a “System of Accounts” table.

Effects	Plan A		Plan B	
	Pros	Cons	Pros	Cons
NED	\$1.5 M in average annual NED benefits	\$1 M in average annual cost	\$1.7 M average annual NED benefits	\$1.5 M average annual cost
EQ	Preserves 500 acres of riverine habitat	Loss of 5 acres of wetlands	Preserves 600 acres of riverine habitat	Loss of 5 acres of wetlands
RED	Local business income increases 30%	1% increase in local taxes for cost share	Local business income increases 35%	1.5% increase in local taxes for cost share
OSE	Provides the opportunity for continued growth and development of community having robust civic infrastructure and diverse and vibrant neighborhoods	Increased tax burden on all, but greater impact on the community's working poor	Provides the opportunity for continued growth and development of community having robust civic infrastructure and diverse and vibrant neighborhoods, plus a more economically resilient business community, and slightly more recreational access to the river for the community	Increased tax burden on all, but greater impact on the community's working poor

In addition to quantifying or describing the effects of various alternatives across the 4 accounts, planners should also apply the 4 P & G criteria (completeness, effectiveness, efficiency and acceptability) to compare how well each alternative meets the 4 criteria for the 4 Accounts. The stakeholders and PDT can develop a minimum standard for these criteria (although what constitutes the “minimum standard” may be problematic) in order to determine whether an alternative is worthy of additional consideration or as means of comparison (see example below).



Source: Planning Manual

- **Advantages:** Transparent; familiar to most planners (based on NED/NER experience); and, at a minimum, satisfies the 4 accounts.

- **Disadvantages:** Hard to combine and make trade-offs which compare effects across accounts; difficult to agree on minimum thresholds; and, need to use subjective judgment when comparing alternatives.

**How do we assess “net beneficial effects” across all 4 accounts when the effects have incommensurate metrics and are not mutually exclusive?**

## **(2) Normalize metrics and perform a trade-off analysis**

This option has generated a lot of interest of late and offers a means of integrating information across multiple criteria, effects, and outputs (from the 4 Accounts, for example) into scores and ranks as a means of plan comparison. This is a step beyond the decision matrix developed with PDT input under Option (1), although much of the same information would be used. In fact, the information gathered for the “System of Accounts” Table actually populates the Decision Matrix that is required for trade-off analysis. Several multi-criteria decision analysis (MCDA) tools and methods are described in IWR’s recent “Tradeoff Analysis Planning & Procedures Guidebook.” Many user-friendly programs such as Expert Choice and Criterium Decision Plus can assist in trade-off and multi-criteria analysis. IWR is also completing efforts on a software program (a plug-in module to IWR Planning Suite) that will allow a PDT to enter scores for as many as seven criteria, including cost. The program will then normalize the data (transforming different quantitative metrics into one common scale) and evaluate combinations of alternatives under a variety of stated preferences (weights), all in a matter of seconds. Again, there is subjectivity involved when considering which criteria to use and more importantly, how to quantify the preference for each criterion. The system can perform sensitivity analysis quite well, which will allow users to test the robustness of each alternative under a variety of scenarios. The main advantage is that all impacts/benefits are quantified.

- **Advantages:** Provides quick evaluation/comparisons; can easily perform sensitivity analysis or “what if?” analysis to assess importance of weights & criteria to decision-making; transforms accounts into a universal and measurable scale; and, many off-the-shelf software programs available
- **Disadvantages:** Tendency to rely on trade-off analysis to provide final answer; learning the software; some subjectivity, particularly with qualitative metrics; may be unnecessary at times (judgment could also work); decision-rule still ultimately required from decision-makers (e.g., minimize regrets, maximize net NED benefits)

**How can we quantify OSE and RED effects?**

By quantifying a plan’s effects, the evaluation and comparison of plans is often easier to perform. There are many ways a planner can quantify the OSE effects given the fact that there are many indicators within the OSE account. RED effects are often monetary, but are not exclusively categorized that way.

## Monetize Outputs

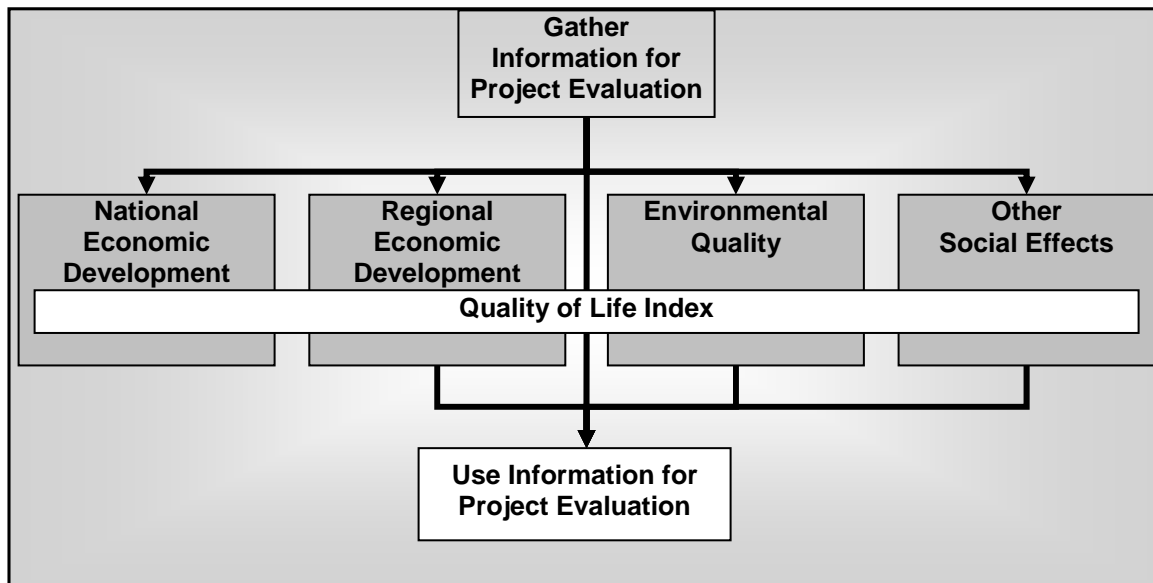
Monetizing outputs would allow the planner to combine the categories easily with a universally-used metric. By now, there is a considerable amount of literature on the subject, but it remains quite controversial, particularly in respect to how lives and environmental resources are valued. None of the recent Administrations nor Congresses has supported monetizing such categories. Nevertheless, in some situations, monetizing could be quite useful. Projects with a heavy NED/RED focus (navigation projects) could be easily evaluated and compared.

- Advantages: Familiar to Corps planners; wealth of existing literature; universal metric (\$)
- Disadvantages: Limited to NED or RED accounts

## Using Quality of Life metrics

In a recent IWR report, “Theoretical Underpinnings—Quality of Life as a Metric” a new indicator, “Quality of Life” which cuts across all four evaluation accounts, was explored. There are a variety of variables which feed into a quality of life index.

Many are defined under Economic Capital (Income, Cost of Living, GDP/person), Natural Capital (Air Quality, Biodiversity, Housing Density), Social Capital or Other Social Effects (Health Care Expenditures, Obesity, Tobacco Use, Crime, Education Levels). According to the GAO (2004), the use of comprehensive social indexes is already widespread. These indexes, despite being used for different purposes, will allow the Corps to tap into existing data streams and provide an additional evaluation



technique.

- Advantages: Provides a widely-used index that encompasses all accounts; enhances collaboration
- Disadvantages: Data intensive; unfamiliar to Corps decision-makers; still not widely accepted; subjective; difficult to determine which account influenced the overall index

**In summary, how should the directive of EC 409 to “evaluate, display, & compare the full range of alternative plans across all 4 P & G accounts” be interpreted?**

A minimum level could be the requirement to develop and display the traditional “Systems of Accounts” or “Effects Matrix” table, but develop the table collaboratively with stakeholder input. The PDT would have to demonstrate and document that all 4 Accounts have at least been considered, even if it turns out that one or more of the accounts is unimportant or insignificant. The information could be qualitative or quantitative.

If a higher degree or more sophistication regarding the directive to “evaluate, display, & compare the full range of alternative plans across all 4 P & G accounts” is warranted, and all the effects can be quantified, then normalizing the disparate metrics and performing a trade-off analysis is option (2). Information populating the “Systems of Accounts” from Option (1) in effect becomes the decision matrix for trade-off analysis. MCDA tools may be employed to effectively display the results of various criteria weights, trade-off algorithms, and sensitivity analyses. Options for quantifying some of the effects to use for trade-off analyses and MCDA tools could include monetization and Quality of Life Metrics.

## **5. Assigning Preferences (Weighting) the 4 Accounts when Comparing and Selecting Plans**

As previously mentioned, the planning team should try to present all the relevant information about plan effects for each account considered. Afterwards, the team will, in most cases, subjectively assign preferences (weight) and balance the effects associated with each plan and decide which plan to recommend to decision makers. Naturally, this evaluation process should not be done in a vacuum but will depend on policy, and the input of sponsors, stakeholders, other agencies, and others.

Some ways a planning team could assign preferences to the accounts for their overall decision are described in the following section.

### **Pre-determined preferences**

Preferences can be pre-determined by virtue of policy. The NED account, for example, could be granted a higher priority for certain types of projects (navigation, single purpose projects, CAP, etc), whereas large watershed studies could allow the preferences to be spread more equitably among the four accounts. The main theme is that Corps HQUSACE sets the rules.<sup>3</sup>

- Advantages: Easy to Implement; standardized throughout the Corps
- Disadvantages: Less flexible; may discourage collaboration; arbitrary weights may not reflect reality; planners might not fully investigate the accounts having less preference.

### **Pre-determined preferences with flexible options**

A modification of this option is to allow the PDT to choose among mandated systems and to define preferences based on the particulars of the project. HQUSACE would still provide guidance detailing methodologies, establish ranges and acceptable practices for multiple preferences schemes, but the PDT would judge which is best for the project. Of course, the extended sponsor/PDT/stakeholders list would need to represent a good cross section of public interest to ensure the process is free from manipulation.

- Advantages: More flexible; provides boundaries for the field
- Disadvantages: Could be prone to bias; lack of uniformity throughout the Corps

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<sup>3</sup> Lack of specific rules implies equal preference for the 4 accounts.

### **Elicitation-based preferences**

Another method of determining preferences is through various elicitation methods, which are rooted in the study of preferences and behavior. One of the most common weight elicitation methods is direct rating (DR). With DR, decision makers are asked to rate each attribute/decision criterion on a scale of 0–100. Research has shown that people using DR tended to produce preferences that were linear when ranked from most to least important. There are several other methods (voting and the like) that are frequently used in public decision-making.

- Advantages: More realistic representation of the public's preferences
- Disadvantages: Time-consuming and costly; bias concerns; lack of uniformity throughout the Corps

## **6. Other Issues for Future Consideration**

### **(1) Portfolio Management**

As one would expect, it would be quite difficult to manage the national portfolio of projects in the context of the 4 accounts. One main difficulty lies with project prioritization. While the OSE and RED accounts can assist with evaluating project alternatives, they are tailored to each particular project and are not easily comparable across the Corps. Other challenges include deciding which parameters should be added to the budget EC criteria each year. Would there be an RED/OSE threshold projects need to achieve to be considered “important” and eligible for funding?

At the very least, the RED and OSE accounts could help defend why projects are important and in fact, HQUSACE has already submitted to OMB requests for budgeting projects that do not meet the minimum BCR criteria established by the Budget EC but could have substantial impacts in terms of lives saved.

### **(2) Can OSE and RED accounts be qualitative?**

We believe they can be qualitative during formulation and even evaluation, but at some point it is advantageous to converting metrics into a measurable format (at least in the form of scales). The significance of the effect’s influences needs to be measured quantitatively while distinctions between alternatives are best described that way. More information will be presented in the IWR handbooks.

### **(3) Would planners still need to measure the several conditions (existing conditions, future without and future with project solutions)?**

In accordance with the P& G and every other guidance, planners would still need to evaluate the effects over a period of analysis. While it is already difficult to forecast the future conditions under the NED account, it can get even trickier for the RED and OSE accounts and creates even more guesswork for the future conditions, particularly because so many external factors can influence the social and economic setting.

Perhaps if an alternative is preferred under a variety of future conditions as well as various preference schemes, and the like, it may be selected as the most robust plan. It is unlikely that one plan will be the optimal for every hypothetical situation, but it is not impossible to develop some that are close.

### **(4) What distinctions need to be made regarding the type of study and business line?**

Watershed studies, by their nature, should result in the most collaborative of solutions. Many of the watershed scale solutions go beyond the Corps’ main mission areas (implementation plans) and so OSE and RED goals would often be realized through alternate channels. Distinctions should be made between single purpose and multi-

purpose projects as well as level of effort (Continuing Authority Project (CAP) study versus feasibility). As previously mentioned, a flood risk management study, should emphasize NED (flood damages) and OSE (lives at risk, community's cohesion) whereas a CAP navigation study may only emphasize NED and/or RED.

**(5) For the RED account, how can we define the area of impact?**

When considering the RED account, planners need to pay close attention to the area of impact, which may vary by situation. For example, Federal investment in Savannah Harbor would provide a net gain to the Nation in the form of transportation efficiencies while at the same time providing RED benefits in the form of additional income, jobs and revenues to the local area. However, the gains in Savannah could be accompanied by losses at a nearby port. If the area of impact is drawn too large, the net RED impacts will become zero.

**(6) What other issues should we consider?**

The IWR team identified a few instances which may stand alone outside of EC 409. For example, subsistence populations, the elderly, and low income populations, which are far more vulnerable to certain types of flooding, should perhaps be given special consideration for project implementation. Certainly RED and OSE would be the main drivers of the argument, but may not appeal to decision-makers comfortable with the NED-only framework.

Finally, many feel that effects such as "health and safety" and public safety should be stand alone, even outside of traditional OSE. And while it is assumed that NED has inherent safety already built into it, loss of life and safety may deserve even stronger attention.

## 7. Summary

Formulation	Pros	Cons
NED/NER-focused formulation, and only displaying OSE/RED accounts	Easy; meets Federal objective; less data intensive; good for CAP studies	Stakeholder dissatisfaction; may fail to capture enough OSE/RED impacts; potential lower project priority
NED/NER-focused formulation, with minimal OSE/RED features	Easy; meets Federal objective; less data intensive; good for CAP studies	Stakeholder may still be dissatisfied; may fail to capture enough OSE/RED impacts; potential disagreement on "minimal" level
	Results in most comprehensive of plans; best for watershed studies; sponsor's involvement & satisfaction greatest	Extremely complex; costly; lack of field experience; difficult to manage; may be cumbersome for smaller projects having straightforward solutions
Formulating for NED/NER/OSE while excluding RED Account	Meets EC 409; manageable; stakeholders satisfied	Complex; costly; lack of field expertise; subjective
Evaluation & Comparison		
Engaging Stakeholders and Displaying Effects in a More Traditional Framework-- "minimal level of interpretation of EC 409"	Familiar to planners; still satisfies EC 409 at a minimum Transparent; applicable in some CAP studies	Subjective with weighting; potential disagreement w/ weights; not easily applicable in complex studies
Normalize/Trade-off Analysis	Can be performed quickly with software; accounts can be transformed into universal scale; useful for sensitivity analyses	Learning the software; some subjectivity; may not always be necessary
Potential Tools for Quantifying OSE and RED Effects		
Monetize Outputs	Familiar to planners; universal metric (\$)	Limited to NED or RED accounts
Quality of Life Metrics	Encompasses all accounts; may enhance collaboration	Data-intensive; unfamiliar to Corps
Prioritization of Accounts		
Predetermined Preferences	Easy to implement; standard throughout the Corps	Inflexible; arbitrary weights may not reflect reality ;may discourage collaboration; planners may not fully investigate minor accounts
Predetermined Preferences w/Flexibility	More flexible than rigid weights yet still provides boundaries for field	Could be prone to bias; lack of uniformity throughout the Corps
Elicitation-based Preferences	Provides a more realistic representation of stakeholder preferences	Time-consuming, costly, potential bias, lack of uniformity throughout the Corps

## **8. Conclusions**

The overarching theme of this white paper is that the planning community needs to fully recognize that the complexity of formulation and evaluation will vary based on the type of business line, the size of study (watershed versus CAP), the conditions of the study area and the preferences of the stakeholders when applying EC 409. As we have seen, the guidance provides high flexibility to Corps planners.

- It is likely that the level of effort will be proportional to the type of study as well as its significance (impact on the scope of project, impact on decision-making, impact on social vulnerability/resilience).
- When applying EC 409, it is essential to consider the accounts as early as the problem identification stage of the planning process.
- Finally, when dealing with multiple criteria, at some point, the planning team needs to identify those criteria believed to be most significant to the water resource problems in the study area. There also needs to be agreement on which OSE metrics are most important for each business line. Naturally, loss of life would be one such metric, but other metrics (tobacco use, high school dropout rate) may or may not be linked directly to the water resources portions of a project.

The Corps has a long and successful track record of formulating and evaluating single purpose projects. It becomes far more difficult to compare alternatives or manage portfolios which are often made up of very dissimilar accounts and non-comparable situations.

## **9. Recommendations**

Upon further discussions with the planning community, it is concluded that the fourth strategy, formulating for NED/NER/OSE but minimizing or excluding RED, would best fulfill the objectives of EC 409 while remaining, on balance, more manageable to the field. The RED account, albeit important, is generally regarded to be less critical when compared to the OSE, NED and EQ accounts, particularly given the present guidance and policy (as well as the proposed revisions to the P & G) which emphasize national benefits, environmental outputs, and public safety<sup>4</sup>. At the very least, RED benefits should be shared with the project sponsors continually throughout the planning process and account for specific case-by-case preferences. However, planners should be aware that over-emphasizing RED could potentially introduce bias into the planning process and may even offset the gains to the other accounts.

When formulating flood risk reduction measures, a PDT should consider its impacts on NED as well as OSE. For example, a floodwall combined with a beefed up flood warning system may reduce flood damages while specifically targeting the elderly or other vulnerable population. Incidental RED benefits to local and regional income can be displayed, but should not have a major bearing on future reformulation.

This is not to say that by minimizing the RED account, planning for multiple accounts would become seamless and easy. Tradeoff analysis, normalization and the other techniques described above require time to implement and can create conflict throughout the decision making process. Fortunately, resources such as the soon-to- be released Multi-Purpose, Multi-Objective Manual and OSE handbook as well as a formulation manual should be useful in assisting planners with this new, complex environment.

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<sup>4</sup> To a lesser extent, a reduced emphasis on RED would likely sit better with budgetary oversight agencies such as Office of Management and Budget and the Congressional Budget Office.





## U.S. Army Engineer Institute for Water Resources

The Institute for Water Resources (IWR) is a Corps of Engineers Field Operating Activity located within the Washington DC National Capital Region (NCR), in Alexandria, Virginia and with satellite centers in New Orleans, LA and Davis, CA. IWR was created in 1969 to analyze and anticipate changing water resources management conditions, and to develop planning methods and analytical tools to address economic, social, institutional, and environmental needs in water resources planning and policy. Since its inception, IWR has been a leader in the development of strategies and tools for planning and executing the Corps water resources planning and water management programs.

IWR strives to improve the performance of the Corps water resources program by examining water resources problems and offering practical solutions through a wide variety of technology transfer mechanisms. In addition to hosting and leading Corps participation in national forums, these include the production of white papers, reports, workshops, training courses, guidance and manuals of practice; the development of new planning, socio-economic, and risk-based decision-support methodologies, improved hydrologic engineering methods and software tools; and the management of national waterborne commerce statistics and other Civil Works information systems. IWR serves as the Corps expertise center for integrated water resources planning and management; hydrologic engineering; collaborative planning and environmental conflict resolution; and waterborne commerce data and marine transportation systems.

IWR provides managerial and technical support to the Civil Works Planning Community of Practice (CoP) in its execution of the Planning Excellence Program. This includes the management of the Planning Associates (PA) program, which is aimed to groom planning leaders capable of managing complex planning studies that lead to quality decision documents and who will provide water resources technical and professional leadership in the future. IWR also provides support to the local delivery of Planning Core Curriculum courses by the Corps MSCs. These seven courses provide the basic, full-performance training needed by entry level planners across the USACE as the means to accelerate their progress to the journeyman stage of their career development. These courses include: Civil Works Orientation, Planning Principles and Procedures, Environmental Considerations, Economic Analysis, H&H Considerations, Plan Formulation and Public Involvement and Team Planning.

In addition to the Planning CoP, the Institute plays a prominent role in the Economics CoP. The Corps Chief Economist is resident at the Institute, along with a critical mass of economists, sociologists and geographers specializing in water and natural resources investment decision support analysis and multi-criteria tradeoff techniques.

For further information on the Institute's activities associated with the Corps Economics Community of Practice (CoP) please contact Chief Economist, Dr. David Moser, at 703-428-6289, or via-mail at: [david.a.moser@usace.army.mil](mailto:david.a.moser@usace.army.mil). The IWR contact for the Corps Planning CoP activities is Ms. Lillian Almodovar at 703-428-6021, or: [lillian.almodovar@usace.army.mil](mailto:lillian.almodovar@usace.army.mil).

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